emask

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Abstract

Creation of detection mask (from exposure images), marking the area on which source searching will be performed.

1 Instruments/Modes

Instrument	Mode
EPIC MOS:	IMAGING
EPIC PN:	IMAGING

2 Use

pipeline processing	yes
interactive analysis	yes

3 Description

Using an exposure image from any of the EPIC instruments, a mask image representing the area on the sky which is searched by the source detection tasks is constructed. Optionally circular or (rotated) box regions read from a fits region file are excluded from the mask. The region file must contain columns SHAPE, X, Y, and R in the extension REGION. This format is provided by the SAS task **ds9tocxc**, the coordinates in X, Y must be image pixels. Up to 1000 regions from the region will be processed. The detection mask is a FITS image containing the integer values 0 and 1 where 1 marks the image area on which source searching will be performed.

4 Parameters

This section documents the parameters recognized by this task (if any).

Parameter	Mand	Type	Default	Constraints

expimageset	yes	filename	expimage.fits	

Names of exposure image

detmaskset	yes	filename	detmask.fits	

Name of detection mask

threshold1	no	float	0.3	[0.0<param<1.0]

Threshold parameter 1: fraction of maximum exposure

threshold2	no	float	0.5	[0.0<param<10.0]

Threshold parameter 2: threshold for gradient of exposure

withregionset	no	binary	false	

Read a fits region file and exclude circular/box regions

regionset	no	filename	region.fits	

Fits region file containing excluded regions

5 Errors

This section documents warnings and errors generated by this task (if any). Note that warnings and errors can also be generated in the SAS infrastructure libraries, in which case they would not be documented here. Refer to the index of all errors and warnings available in the HTML version of the SAS documentation.

Exposure images from different instruments have different pixel sizes, image sizes, center coordinates (RA, Dec), or north vectors (not yet implemented) *(fatal)*

ColumnNotFound *(warning)*
Column X, Y, R or SHAPE missing in region fits file
corrective action: Ignore region file

WrongShape *(warning)*
Entry SHAPE in region file is not CIRCLE or ROTBOX
corrective action: Ignore entry in region file

6 Input Files

1. PPS product (from task EEXPMAP): EPIC exposure image

7 Output Files

1. Detection mask (to be used by tasks EBOXDETECT, ESPLINEMAP, ESENSMAP) The detection mask is a FITS image with the same binning as the EPIC FITS images containing the integer values 0 or 1.

8 Algorithm

```
Begin subroutine emask

  Determine maximum of exposure
  Multiply threshold parameters with exposure maximum

  Optionally read region file

  Loop over image pixels
    Set pixels of detection mask to 1 if exposure is above cutoff
      and 0 otherwise.
    Set pixels inside excluded regions to 0.
  END Loop

  Loop over image pixels
    Set pixels of detection mask to 0 if gradient of exposure
      is above threshold .
  END Loop

End subroutine  emask
```

9 Comments

10 Future developments

- Add error handling and verbosity control.
- Add capability to operate on multiple exposure maps (see developer notes).

References